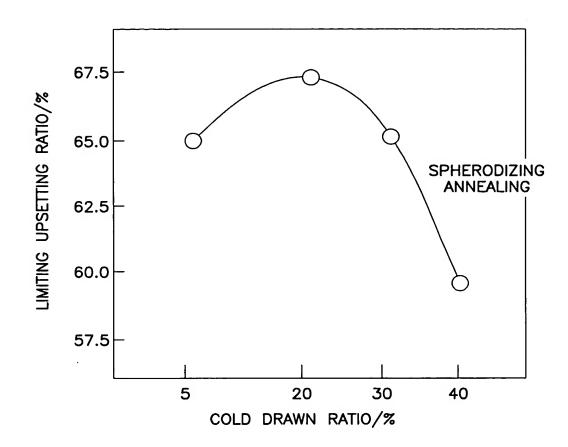


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FIG.2



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FIG. 3A

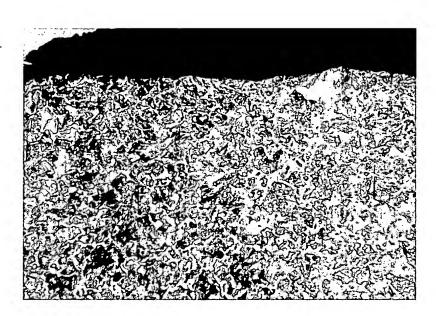


FIG. 3B

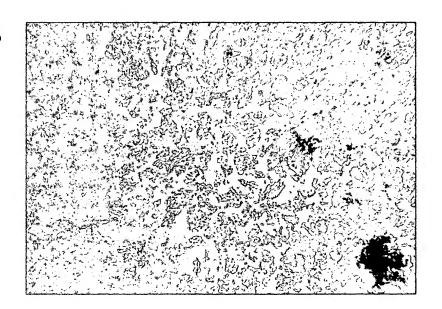


Inventor: Ando, et al
Docket No.: 12052.0033USD1
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FIG. 4A



FIG. 4B

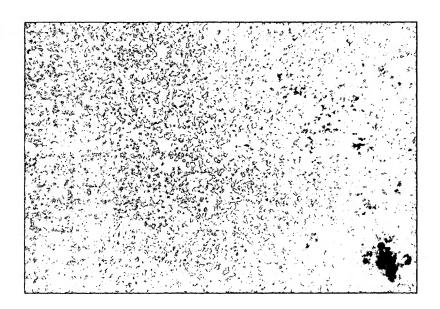


Inventor: Ando, et al
Docket No.: 12052.0033USD1
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FIG. 5A



FIG. 5B



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# FIG. 6A

MATERIAL 1 ASPECT RATIO = 506%

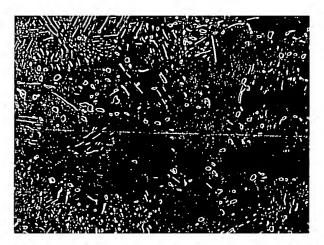


FIG. 6B

MATERIAL 2 ASPECT RATIO = 347%

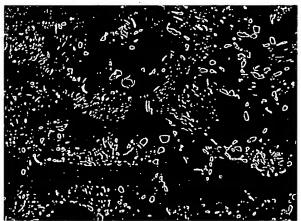
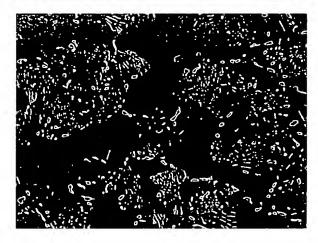
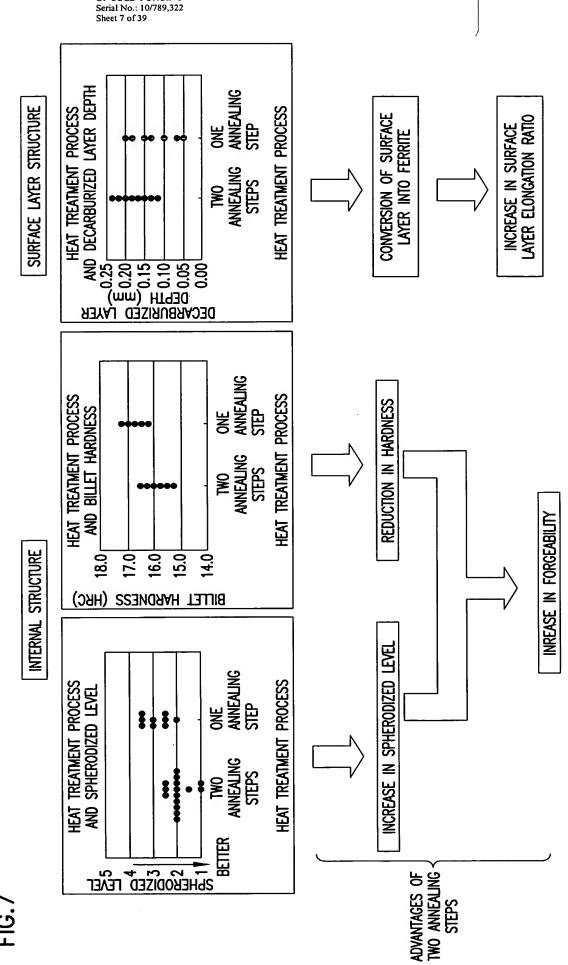


FIG. 6C

MATERIAL 3 ASPECT RATIO = 300%

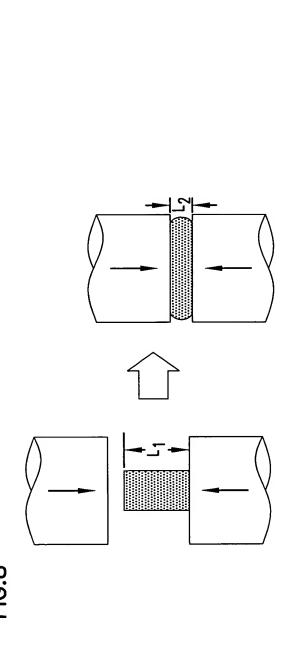




Title: BILLET FOR COLD FORGING, METHOD OF MANUFACTURING BILLET FOR COLD FORGING, METHOD OF CONTINUOUSLY COLD-FORGING BILLET, METHOD

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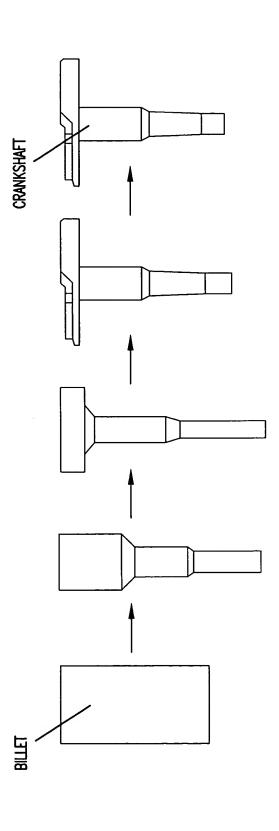


FIG. 10

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Docket No.: 12052.0033USD1
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FIG.11A

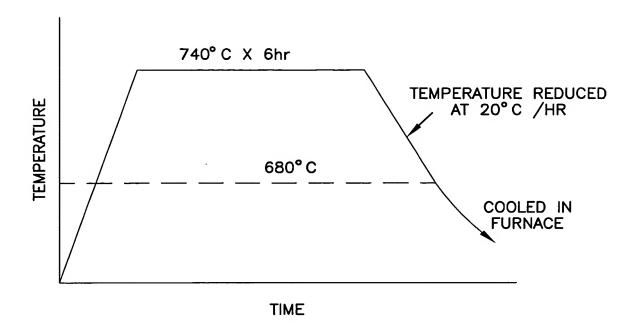
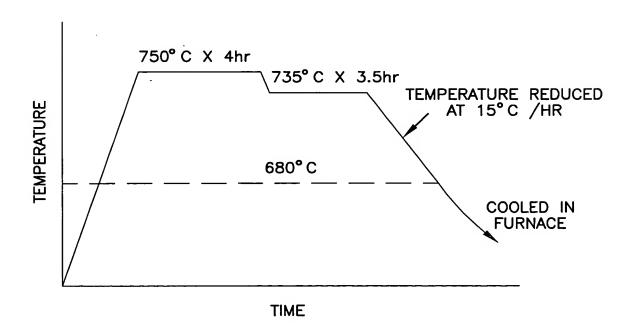
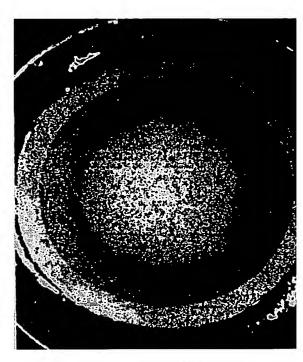


FIG.11B

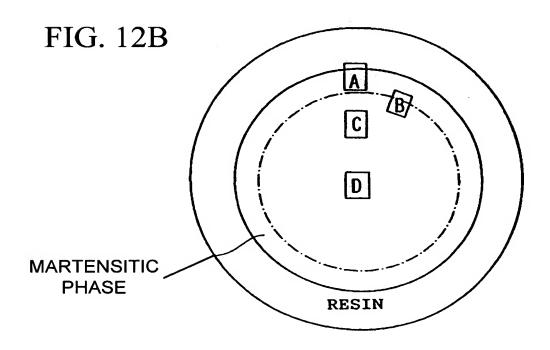


Inventor: Ando, et al Docket No.: 12052.0033USD1 DOCKET NO.: 12032.0033USD1
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FIG. 12A



MARTENSITIC MATERIAL PRIOR TO SPHERODIZING ANNEALING X2. 1

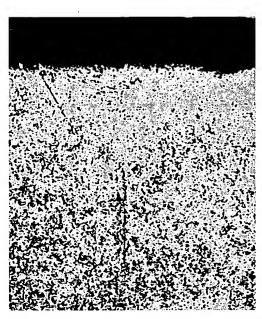


Inventor: Ando, et al Docket No.: 12052.0033USD1

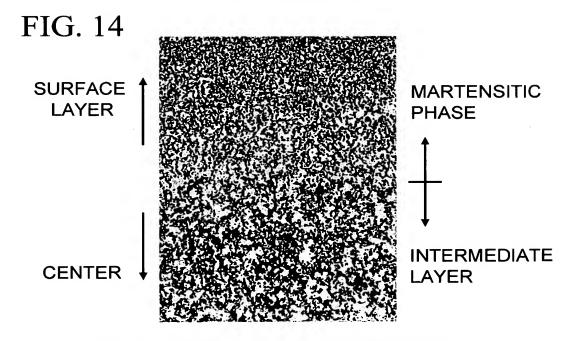
Title: BILLET FOR COLD FORGING, METHOD OF MANUFACTURING BILLET FOR COLD FORGING, METHOD OF CONTINUOUSLY COLD-FORGING BILLET, METHOD

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FIG. 13



PRIOR TO SPHERODIZING ANNEALING SURFACE LAYER X 100



PRIOR TO SPHERODIZING ANNEALING SURFACE LAYER AND INTERMEDIATE LAYER X 200

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FIG. 15



PRIOR TO SPHERODIZING ANNEALING 1/2 R PART X 400

FIG. 16

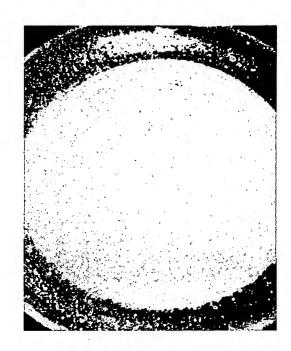


PRIOR TO SPHERODIZING ANNEALING CENTRAL PART X 400

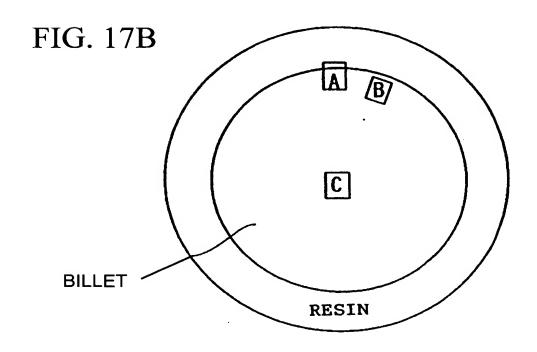
Inventor: Ando, et al

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FIG. 17A



MARTENSITIC MATERIAL AFTER SPHERODIZING ANNEALING PATTERN 1 X2. 1



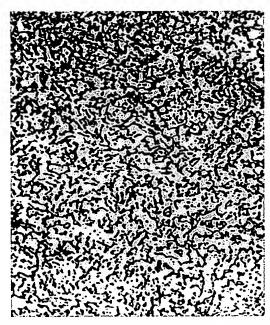
Inventor: Ando, et al
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FIG. 18



AFTER SPHERODIZING ANNEALING PATTERN 1 **SURFACE LAYER X 100** 

FIG. 19



AFTER SPHERODIZING ANNEALING PATTERN 1 **SURFACE LAYER X 400** 

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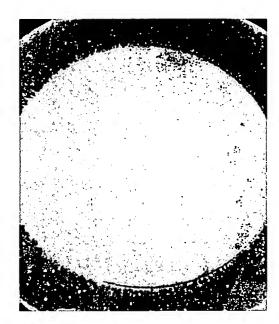
FIG. 20



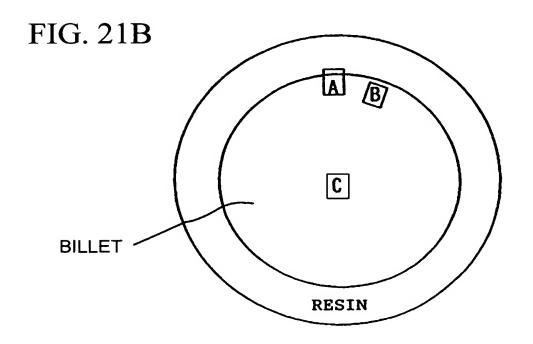
AFTER SPHERODIZING ANNEALING PATTERN 1 1/2 R PART X 400

Inventor: Ando, et al
Docket No.: 12052.0033USD1
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# FIG. 21A



MARTENSITIC MATERIAL
AFTER SPHERODIZING ANNEALING PATTERN 1
X2. 1



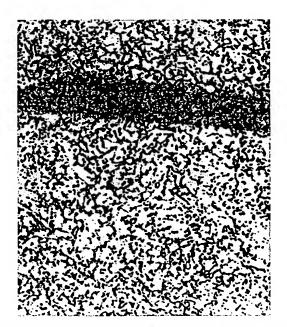
Inventor: Ando, et al
Docket No.: 12052.0033USD1
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FIG. 22



AFTER SPHERODIZING ANNEALING PATTERN 2 SURFACE LAYER X 100

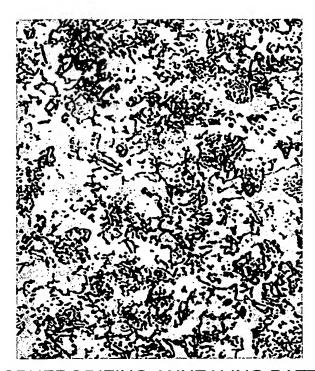
FIG. 23



AFTER SPHERODIZING ANNEALING PATTERN 2 SURFACE LAYER X 400

Inventor: Ando, et al
Docket No.: 12052.0033USD1
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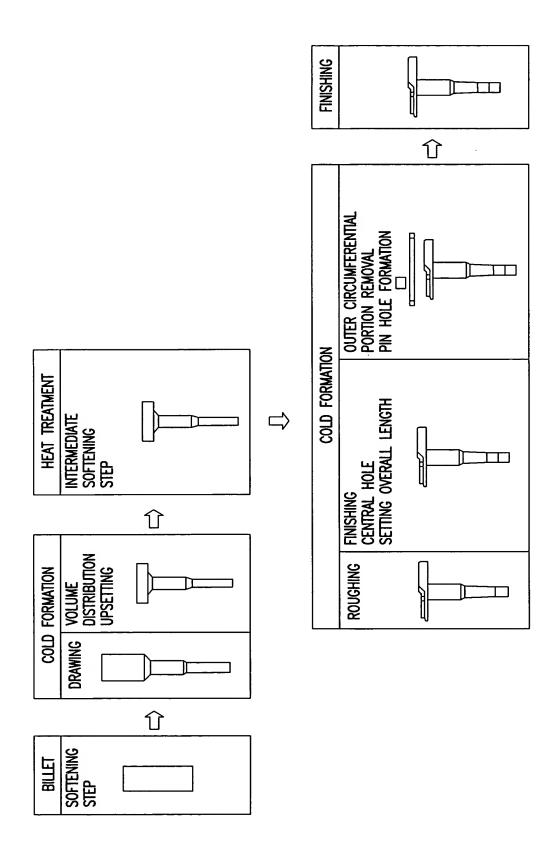
FIG. 24



AFTER SPHERODIZING ANNEALING PATTERN 1 1/2 R PART X 400

Inventor: Ando, et al
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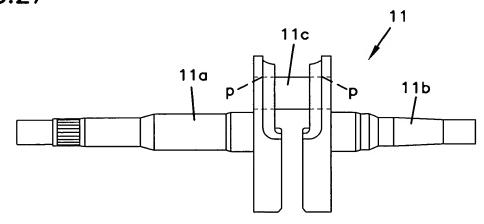
Inventor: Ando, et al Docket No.: 12052.0033USD1
Title: BILLET FOR COLD FORGING, METHOD OF MANUFACTURING BILLET FOR COLD FORGING, METHOD OF CONTINUOUSLY COLD-FORGING BILLET, METHOD OF COLD-FORGING
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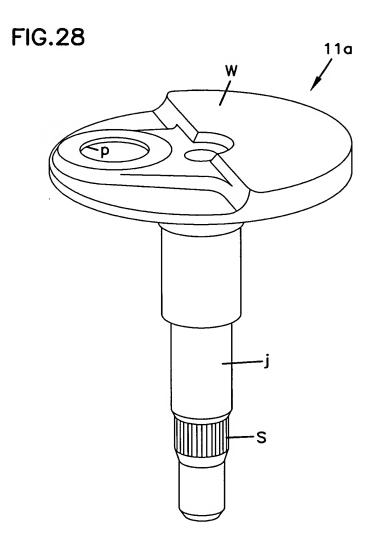
MACHINING OUTER CIRCUMFERENTIAL PORTION REMOVAL PIN HOLE FORMATION COLD CONTINUOUS FORMATION FINISHING CENTRAL HOLE SETTING OVERALL I ROUGHING VOLUME DISTRIBUTION UPSETTING DRAWING ① SPHERODIZING ANNEALING

FIG. 26

Inventor: Ando, et al
Docket No.: 12052.0033USD1
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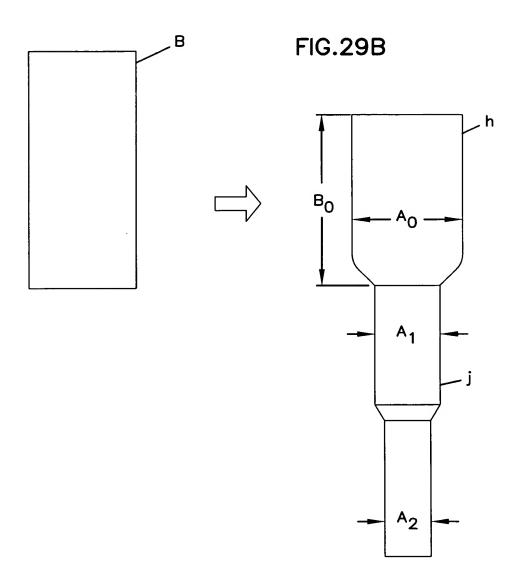
FIG.27





Inventor: Ando, et al
Docket No.: 12052.0033USD1
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FIG.29A



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FIG.30A

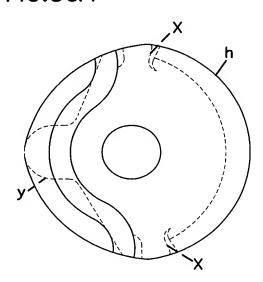


FIG.30B

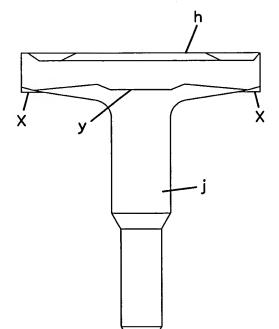
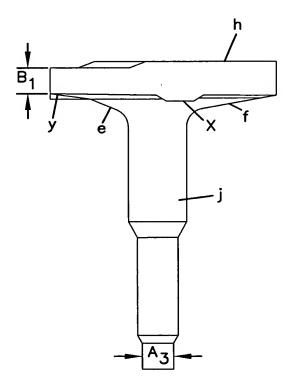
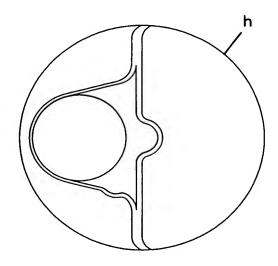


FIG.30C

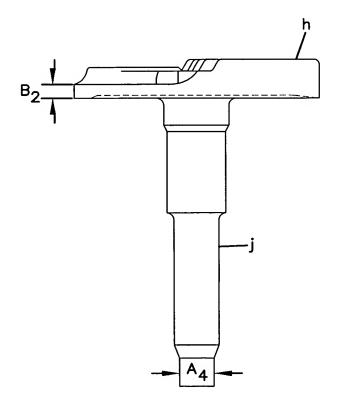


Inventor: Ando, et al
Docket No.: 12052.0033USD1
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# FIG.31A



### FIG.31B



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FIG.32A

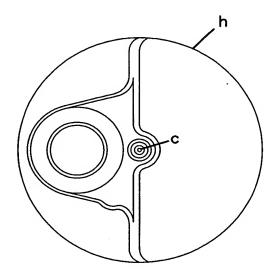
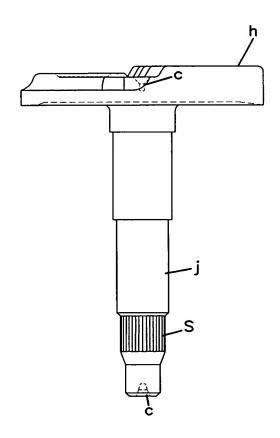


FIG.32B



Inventor: Ando, et al Docket No.: 12052.0033USD1
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FIG.33A

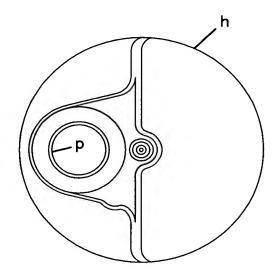
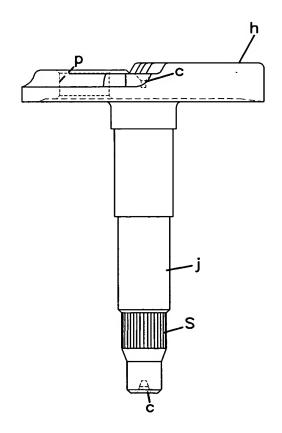


FIG.33B

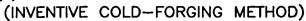


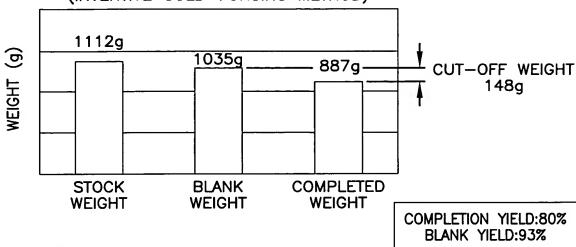
Inventor: Ando, et al

Docket No.: 12052.0033USD1
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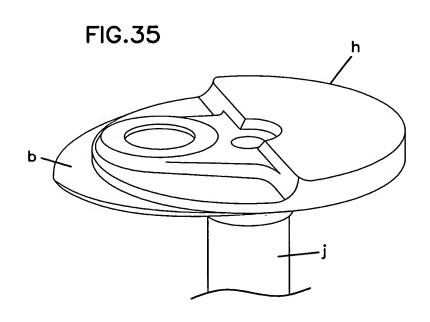
#### FIG.34A





#### FIG.34B

(INVENTIVE COLD—FORGING METHOD) 1530g 1245g CUT-OFF WEIGHT WEIGHT (g) 887g 358g COMPLETED **BLANK STOCK WEIGHT WEIGHT WEIGHT** COMPLETION YIELD:58% **BLANK YIELD:81%** 



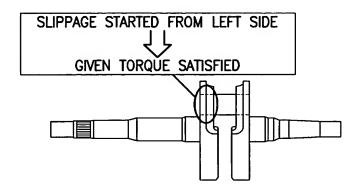
Inventor: Ando, et al

Docket No.: 12052.0033USD1
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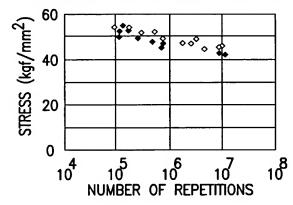
#### FIG.37A

#### SLIP TORQUE



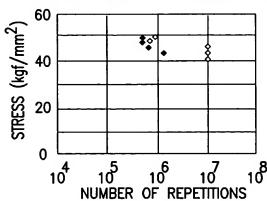
#### FIG.37B

#### S - N CURVE (ROTATIONAL BENDING FATIGUE TEST)



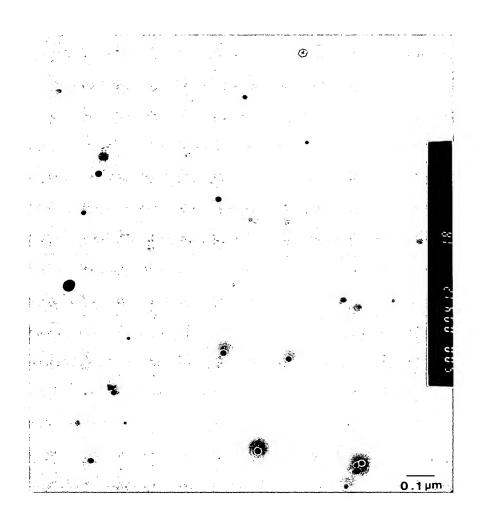
#### **FIG.37C**

#### S - N CURVE (SOLID BENDING FATIGUE TEST)



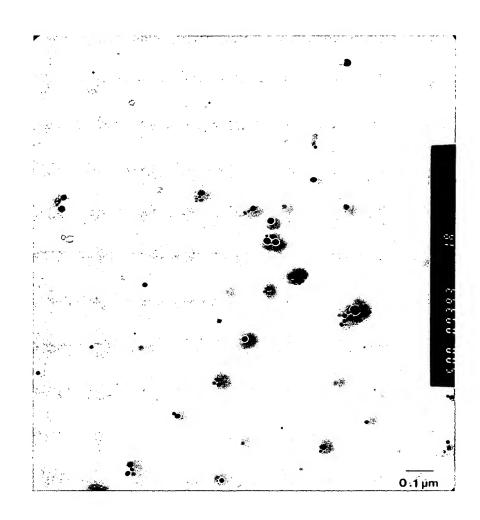
Inventor: Ando, et al
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FIG. 38



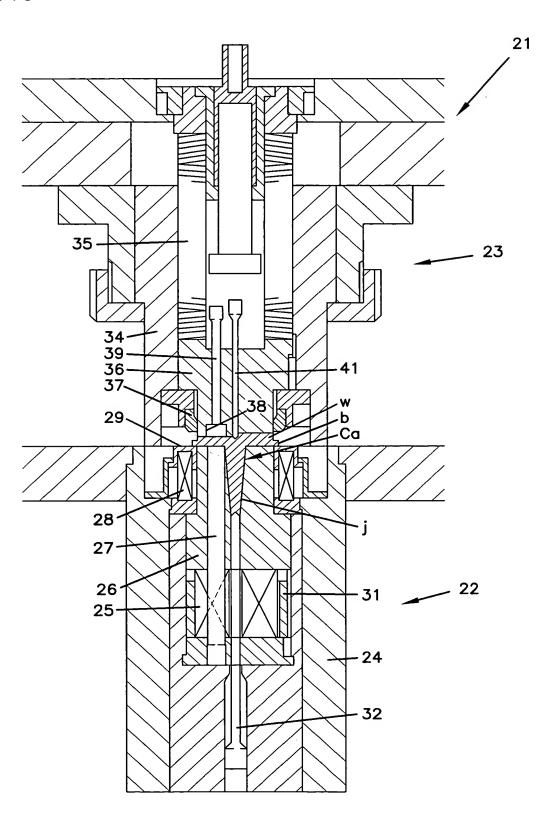
Inventor: Ando, et al
Docket No.: 12052.0033USD1
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# FIG. 39



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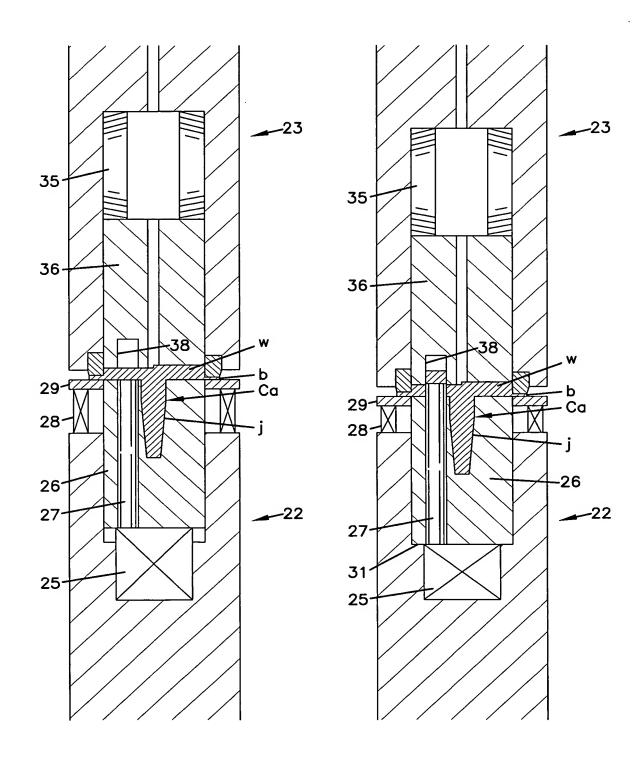
FIG.40



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FIG.41A

FIG.41B

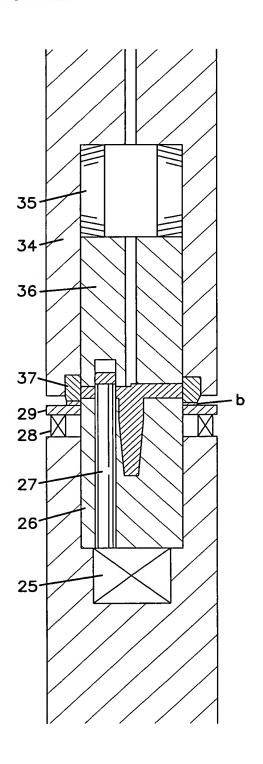


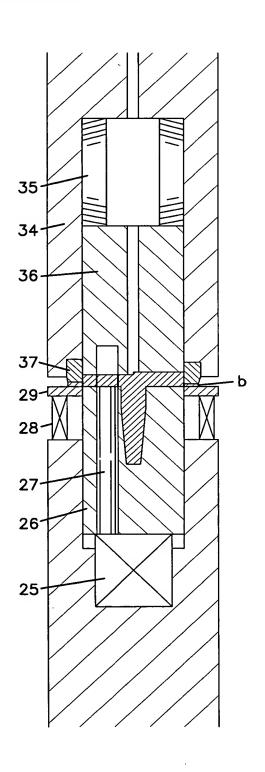
Inventor: Ando, et al
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Title: BILLET FOR COLD FORGING, METHOD OF MANUFACTURING BILLET FOR
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FIG.42A

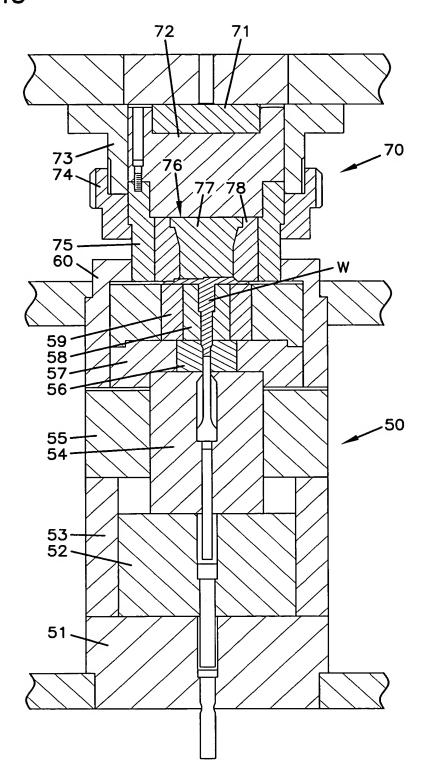
FIG.42B





Inventor: Ando, et al
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Title: BILLET FOR COLD FORGING, METHOD OF MANUFACTURING BILLET FOR
COLD FORGING, METHOD OF CONTINUOUSLY COLD-FORGING BILLET, METHOD
OF COLD-FORGING
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# **FIG.43**



Inventor: Ando, et al
Docket No.: 12052.0033USD1
Title: BILLET FOR COLD FORGING, METHOD OF MANUFACTURING BILLET FOR
COLD FORGING, METHOD OF CONTINUOUSLY COLD-FORGING BILLET, METHOD
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**FIG.44** 

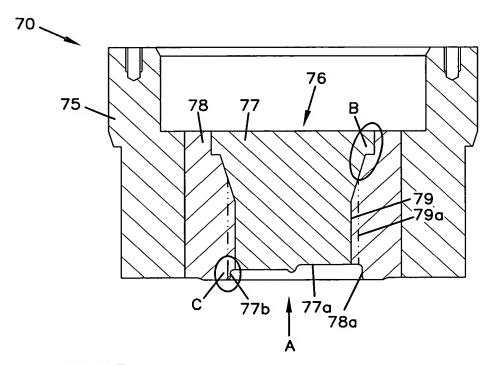
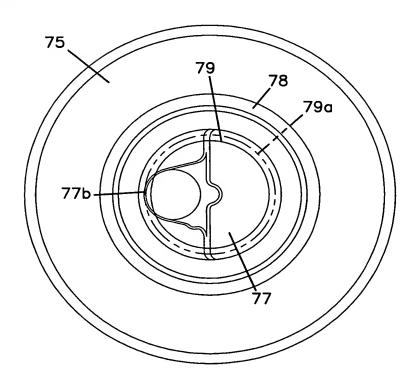


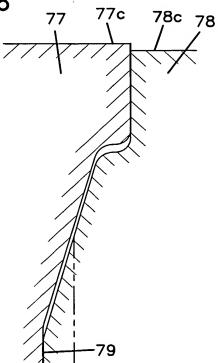
FIG.45

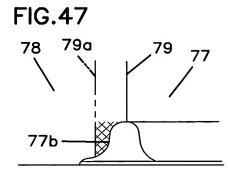


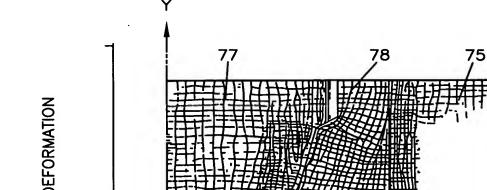
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Docket No.: 12052.0033USD1
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COLD FORGING, METHOD OF CONTINUOUSLY COLD-FORGING BILLET, METHOD OF COLD-FORGING Serial No.: 10/789,322 Sheet 38 of 39

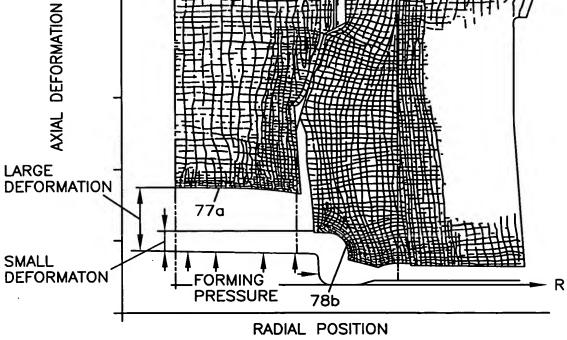


**FIG.48** 





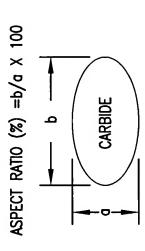




/		BILLE	T MANU	BILLET MANUFACTURING PROCESS		ACDENT DATIO	CBACK
	SPHERODIZING ANNEALING PRIO DRAWING TO DRAWING	DRAWING	CUTTING	SUBSEQUENT TO DRAWING	SHOT BONDERIZING	OF CARBIDE (%)	PER
MATERIAL 1	NONE	NONE	0	0	, O	506	35%
MATERIAL 2	NONE	(20%) O	0	0	0	347	5%
MATERIAL 3	0	(20%)	0	0	0	300	%0

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